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Western Utilization Research Branch
Agricultural Research Service
United States Department of Agriculture

JULY 1 TO DECEMBER 31, 1954

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Southern Utilization Research Branch
2100 Robert E. Lee Blvd., New Orleans 19, La.

ANALYTICAL AND GENERAL

(Other analytical papers related to specific commodities are included in later sections.)

OXIDATION OF DI-T-BUTYLPYROGALIOL BY OXYGEN IN ALKALINE SOLUTION. II. ABSORPTION SPECTRA OF THE PRODUCTS. F. Stitt, G. F. Bailey, G. M. Coppinger, and T. W. Campbell, Jour. Amer. Chem. Soc. 76(14):3642-46, July, 1954. Ultraviolet and infrared absorption spectra are presented and discussed in relation to structures assigned on the basis of chemical and spectroscopic data. The principal types of structures are substituted alpha-pyrones, cyclopentenediones, and cyclopentanediones.

AN ADAPTABLE HEATING STAGE WITH ELECTRICALLY CONDUCTIVE GLASS FOR BIOLOGICAL MICROSCOPY. R. M. Reeve and B. Makower, Stain Technol. 29(4):201-205, July, 1954. An adaptable heating stage was constructed by modifying a detachable mechanical stage to hold a heating element consisting of a 3-1/2-inch square plate of electrically conductive glass.

REPORT ON SUGARS IN PLANTS. K. T. Williams and E. F. Potter, Jour. Assoc. Offic. Agr. Chem. 37(3):718-721, Aug., 1954. It was found that sugar could be extracted quantitatively from certain vegetables without Soxhlet extraction, thereby saving the analyst considerable time.

PHOTOMETRIC DETERMINATION OF GLUCOSE IN THE PRESENCE OF FRUCTOSE. F. Stitt, S. Friedlander, H. J. Lewis, and F.E. Young, Analyt. Chem. 26(9):1478-84, Sept., 1954. A method has been developed for measuring from 0.05 to 1.0 percent of glucose in fructose. This method can readily be extended to cover the entire range of composition of glucose-fructose mixtures and it appears to be generally applicable to the measurement of aldoses in the presence of ketoses.

QUANTITATIVE DETERMINATION OF SUGARS ON PAPER CHROMATOGRAMS BY A REFLECTANCE METHOD. R. M. McCready and E. A. McComb, Analyt. Chem. 26(10):1645-47, Oct. 1954. A general method for the direct quantitative determination of sugars on paper chromatograms by reflection density is proposed. Optimum wave length of reflected light, variety of paper, amount of sugar, and method of measurement of reflection density are reported.

REFRACTIVE INDICES OF DEXTROSE SOLUTIONS BETWEEN 15° AND 30°. F. E. Young and F. T. Jones, Jour. Assoc. Offic. Agr. Chem. 37(4):932-938, Nov., 1954. Refractive indices of dextrose solutions containing up to 84.4 percent dextrose have been measured in the range from 12° to 41°. Tables are included in which dextrose percentage can be calculated readily from refractive indices measured in the range from 15° to 30°.

*CARD SORTING DEVICE. Patent 2,683,458 to M. E. Davis and J. C. Jacobsen, July 13, 1954. The invention concerns a drawer adapted for storage of perforated cards and for sorting these cards according to the information on each. A feature of the device is that it is not necessary to remove the drawer from its regular compartment to carry out a sorting operation; the drawer is merely pulled half way out and by insertion of needles or the like the desired cards are separated from the remainder.

FIELD CROPS--Alfalfa, Rice, Sugar Beets, Wheat

Alfalfa

XANTHOPHYLL DETERMINATION IN DEHYDRATED ALFALFA MEAL. E. M. Bickoff, A. L. Livingston, G. F. Bailey, and C. R. Thompson, Jour. Assoc. Offic. Agr. Chem. 37(3):894-902, Aug., 1954. Two methods for carotene are examined with regard to their suitability for xanthophylls. The methods proposed are relatively rapid and suitable for routine use.

REPORT ON XANTHOPHYLL IN MIXED FEEDS. C. R. Thompson, Jour. Assoc. Offic. Agr. Chem., 37(3):756-757, Aug., 1954. The author as Associate Referee reports a general inquiry on methods used and recommends that determination of xanthophyll in mixed feeds continue to be studied and that samples be submitted to a number of laboratories for analyses by a chromatographic method.

ALFALFA CAROTENE-QUINOLINE DERIVATIVES AS ANTIOXIDANTS FOR CAROTENE. E. M. Bickoff, A. L. Livingston, J. Guggolz, and C. R. Thompson, Jour. Agr. and Food Chem. 2(24):1229-31, Nov. 24, 1954. Comparative values for carotene stabilizing effect in mineral oil and alfalfa meal were determined for 40 derivatives of quinoline. Relationships between molecular structure and antioxidant activity are reported.

*RUMINANT BLOAT--ITS RELATIONSHIP TO THE COMPOSITION OF ALFALFA AND CLOVER (abstract). C. R. Thompson, Stockmen's Handbook, pp. 98-99, Washington State College, Stockmen's Short Course, Dec., 1954. A summary of a lecture presented in the shortcourse for stockmen.

*STABILIZATION OF FORAGE CROPS WITH HYDROQUINONE DERIVATIVES. Patent 2,686,124 to E. M. Bickoff, Aug. 10, 1954. The carotene content of alfalfa is stabilized by treating the alfalfa with certain hydroquinone derivatives, such as 2,5-ditertiarybutyl-3,6-bis(dimethylaminomethyl) hydroquinone. For example, alfalfa treated with 0.125 percent of this hydroquinone derivative stored at 65°C. for 14 days retained 55 percent of its original carotene. Untreated alfalfa stored under the same conditions retained only 22 percent of its original carotene.

Rice

*WAXY RICE FLOUR IMPROVES FROZEN CANNED FOODS. H. Lineweaver, Rice Jour. 57 (10):20, Oct., 1954. A summary of research on use of waxy rice flour in frozen and heat-processed canned foods.

CEREAL STORAGE EFFECTS. DETERIORATIVE CHANGES IN THE OIL FRACTION OF STORED PARBOILED RICE. D. F. Houston, I. R. Hunter, E. A. McComb, and E. B. Kester, Jour. Agr. and Food Chem. 2(23):1185-90, Nov. 10, 1954. Changes in the oil fraction of stored parboiled rice have been followed as criteria of loss in quality. Storage of parboiled rice in the dark at several temperatures permitted a study of rancidification and of non-enzymatic changes in the oil as measured by peroxides, monocarbonyl compounds, and free acids.

WAXY RICE FLOUR IMPROVES FROZEN AND CANNED PRECOOKED FOODS. Hans Lineweaver. Research Achievement Sheet 173, 2 pages, Agricultural Research Service, U.S. Dept. of Agriculture, Sept., 1954. A summary of achievement in research, with selected references and estimate of costs.

*PROCESS OF CANNING RICE. Patent 2,686,130 to R. L. Roberts, Aug. 10, 1954. White rice is subjected to soaking and cooking under controlled conditions so that its moisture content is raised only to about 50 percent. This partially cooked rice is then packed into cans under high vacuum and the sealed cans are subjected to heat processing to ensure sterility. A critical factor is the limitation on amount of water taken up by the rice during initial soaking and cooking whereby the grains remain separate in the cans and do not stick together as they would if initially cooked completely, that is, to a moisture content of 65 to 75 percent. In addition, sealing under high vacuum has the effect of preserving the white color. (Note: this patent has been dedicated to the public--no license is required.)

Sugar Beets

FRACTIONATION OF ORGANIC ACIDS IN SUGAR BEETS BY MEANS OF ION EXCHANGE RESINS. H. S. Owens, A. E. Goodban, and J. B. Stark, Proc. Tech. Session (1953) on Bone Char, pp. 221-232, published 1954. Experimental details of the method and results of application to sugar-beet diffusion juices are presented. Published previously in Analyt. Chem. 25(10):1507-11, Oct. 1953.

Wheat

THE ALBUMIN AND GLOBULIN CONTENTS OF WHEAT FLOUR AND THEIR RELATIONSHIP TO PROTEIN QUALITY. J. W. Pence, N. E. Weinstein, and D. K. Mecham, Cereal Chem. 31(4):303-311, July, 1954. The coefficient of regression of loaf volume on flour protein for each of the flours was used as an estimate of baking quality of the protein systems of the various flours. Neither the amounts of soluble proteins nor the proportions of soluble to gluten protein were found to be correlated significantly with protein quality. The ratio of albumins to globulins contained by the flours, however, was correlated with protein quality beyond the 1 percent point of significance. Although total protein content of the flour was also correlated very significantly with protein quality, the partial correlation of albumin-to-globulin ratio with protein quality (obtained by holding flour protein constant) retains a high degree of significance.

DIFFERENCES IN THE DISTRIBUTION OF COMPONENTS IN ALBUMIN PREPARATIONS FROM DURUM AND COMMON WHEAT FLOURS. J. W. Pence, N. E. Weinstein, and D. K. Mecham, Cereal Chem. 31(5):396-406, Sept., 1954. The relative amounts of individual components in albumins prepared by a standardized procedure from durum wheat flours were found to differ characteristically from those observed in similar preparations from club and common wheat flours.

FRUIT, PECTIN, AND ENZYMES

DEHYDROFREEZING OF FRUITS AND VEGETABLES. W. F. Talburt and F. E. Lindquist, Food Science Abstracts 26(4):361-368, July, 1954. A review of work done at Western Utilization Research Branch on the dehydrofreezing of fruits and vegetables.

NEW THROUGH-FLOW ROTARY DRIER FOR THE PARTIAL DRYING OF APPLE SLICES. W. C. Rockwell, E. Lowe, G. S. Smith, and M. J. Powers, Food Technol. 8(11):500-502, Nov., 1954. A new type of through-flow rotary drier developed to dehydrate apple slices partially in preparation for dehydrofreezing is described.

EFFECT OF SUCROSE AND ASCORBIC ACID ON QUALITY RETENTION IN FRESH AND FROZEN STRAWBERRY PUREE. D. G. Guadagni, Food Research 19(4):396-401, July-Aug., 1954. Experiments on effect of sucrose and ascorbic acid on quality of fresh and frozen strawberry puree indicate that deteriorative changes in quality of fresh puree occur within 2 to 3 hours at room temperature and that sucrose neither prevents nor minimizes these changes. Addition of sucrose or ascorbic acid offered no advantage during freezing, storage, and defrosting.

CONCENTRATION OF STRAWBERRY JUICE. L. H. Walker, G. K. Notter, R.M. McCready, and D. C. Patterson, Food Technol. 8(8):350-352, Aug., 1954. Methods are presented for preparation of concentrated strawberry juice and for recovery of volatile flavor constituents. Causes of gelation of juice, clarification by use of pectic enzymes, effect upon product of varying percentages of evaporation during essence recovery, and effect of temperatures during concentration were determined.

TEXTURE CHANGES IN BRINED CHERRIES. R. M. McCready and E. A. McComb, West. Canner and Packer 46(13):17, 19, Dec., 1954. Firm cherry tissue contains pectic substances of a low degree of esterification and a very high molecular weight. Pectinesterase causes the pectin to be converted to pectic acid. In the presence of calcium ions supplied by the brine, a firm calcium pectate gel is produced within the tissue. The probable explanation for softening is that pectic substances are degraded to materials of low molecular weight by enzymes.

DEGREE OF HEAT INACTIVATION OF POLYPHENOL OXIDASE AND QUALITY OF FROZEN APRICOT PUREE. J. D. Ponting, R. S. Bean, G. K. Notter, and B. Makower, Food Technol. 8(12):573-575, Dec., 1954. Apricot puree was given various heat treatments with respect to time and temperature and then frozen and stored for 3, 6, and 12 months at 4 different sub-freezing temperatures. It was found that the best quality of puree was obtained by heating just enough to completely inactivate the polyphenol oxidase. Less heating allowed rapid browning and resulted in an oxidized flavor, while excessive heating caused a cooked and sometimes bitter flavor.

SUGAR IN FROZEN FOODS. W. F. Talburt. In Advances in Chemistry Series, No.12, Uses of Sugars & Other Carbohydrates in Food Industry. A report on the use of sugars and other types of sweeteners in frozen foods. Sucrose has been found the most acceptable, since it does not limit the end-use of the product. Dextrose, dextrose hydrate, or corn sirup can be used to replace up to one-third of the normal sucrose requirement in most frozen fruits without adversely affecting color, flavor, or texture of product. High-conversion corn sirup or corn sirup solids, alone or in combination with other sweeteners, can also be used.

*VARIETAL COMPARISON OF FRESH FIGS FOR FREEZING AND PRESERVE MANUFACTURE. M. J. Powers, Proc. Calif. Fig. Inst., Annual Conference, March 3, 1953, Fresno, Calif. pp. 35-38, mimeographed. Studies on pH, sugar content, and enzymic activity (ficin) of fresh figs of three maturities and on freezing and preserve manufacture are reported. Certain varied additives such as pectin, fruit acid, and spices were used.

METABOLISM OF APPLES. CONVERSION OF GLUCOSE TO SUCROSE IN APPLE TISSUE. B. Axelrod and C. G. Seegmiller, Jour. Agr. and Food Chem. 2(26):1329-31, Dec. 22, 1954. When radioactive glucose is infiltrated into apple discs, radioactive sucrose, but not fructose, is formed. The process is inhibited by exclusion of oxygen. Although both moieties of the sucrose molecule are labeled, most of the activity is found in the glucose portion. Some action appears also in some amino acids.

PECTIC CONSTITUENTS IN RIPE AND UNRIPE FRUIT. R. M. McCready and E. A. McComb, Food Research 19(5):530-35, Sept.-Oct., 1954. Pectic substances were extracted by mild means from ripe and unripe Elberta peaches, Bartlett pears, and Fuerte avocados, precipitated with ethanol, and characterized by analysis. Results suggest that, in the fruits studied, pectic enzymes come in contact with the pectic substances during ripening and hydrolyze them to materials of lowered molecular sizes. The degraded materials are then less effective in maintaining firm structures in fruits and less important in contributing to consistency of processed foods.

FACTORS INFLUENCING GELATION WITH PECTIN. H. S. Owens, H. A. Swenson, and T. H. Schultz, In Advances in Chemistry Series, No. 11, Natural Plant Hydrocolloids, 1954, pp. 10-15. A review of the gelation studies under way at WURB to establish the background necessary for a theory of pectin gel formation. Factors investigated that control the properties of pectin were: pH, degree of esterification, effect of acylation, temperature, and molecular weight.

REACTION INACTIVATION OF POLYPHENOLOXIDASE: TEMPERATURE DEPENDENCE. L. L. Ingraham, Jour. Amer. Chem. Soc. 76(14):3777-80, July, 1954. The reaction-inactivation reaction is apparently a fairly simple reaction and does not involve any extensive damage to the protein, such as denaturation or dissociation.

PURIFICATION AND PROPERTIES OF PHOSPHORIBOISOMERASE FROM ALFALFA. B. Axelrod and R. Jang, Jour. Biol. Chem. 209(2):847-855, Aug., 1954. The purification and properties of phosphoriboisomerase from alfalfa are described and a simple assay procedure is presented. Presence of the enzyme in other plant materials is demonstrated.

POULTRY PRODUCTS

CONSUMER-TYPE APPRAISAL OF WHOLE EGG POWDER STABILIZED BY GLUCOSE REMOVAL (YEAST FERMENTATION) AND BY ACIDIFICATION. H. L. Hanson and L. Kline, Food Technol. 8(8):372-376, Aug., 1954. Relative preference for whole egg powder stabilized by glucose removal and by acidification has been determined for groups of 40 individuals by paired preference and hedonic-scale tests. Tests showed little difference in the two types of eggs compared as scrambled eggs immediately after dehydration. During storage at 100°F. there was an increasing preference for the glucose-free egg.

COMPARISONS OF THE QUALITY AND STABILITY OF WHOLE EGG POWDERS DESUGARED BY THE YEAST AND ENZYME METHODS. L. Kline, T. T. Sonoda, and H. L. Hanson, Food Technol. 8(8):343-349, Aug., 1954. Enzyme- and yeast-desugared whole-egg solids were examined by chemical methods for changes induced by processing. The comparative initial qualities of the two powders were determined by baking performance, trained-panel evaluation, and consumer-type preference testing. The relative stabilities of the two powders were appraised by the same methods after storage at 100°F.

*EXPERIMENTAL COMPARISONS OF THE QUALITY AND STABILITY OF ACIDIFIED, YEAST-FERMENTED, AND GLUCOSE-OXIDASE-DESUGARED WHOLE EGG POWDERS AS EVALUATED BY CHEMICAL, PHYSICAL AND SENSORY TESTS. L. Kline, Symposium on Stability of Dehydrated Eggs, Feb., 1953, sponsored by Quartermaster Food and Container Institute. Published Sept., 1954 by National Academy of Sciences, Washington, D.C., pp. 10-19. Research on stabilization of whole-egg powders over the past ten years is reviewed. Special attention is given to more recent studies devoted to the comparative stabilities and other characteristics of whole-egg powders prepared by the three methods.

*COMPARISON OF GLUCOSE-FREE AND ACIDIFIED WHOLE EGG POWDERS BY SENSORY TESTS. H. L. Hanson. Symposium on Stability of Dehydrated Eggs, Feb., 1953, sponsored by Quartermaster Food and Container Institute. Published by National Academy of Sciences, Washington, D.C., Sept., 1954, pp. 31-33. The greater stability of fermented as compared with acidified dried eggs is characterized. This improved stability is accomplished without any decrease in acceptability of the unstored dried egg.

*A DILUTION METHOD FOR DETERMINATION OF RELATIVE FLAVOR STABILITY OF EGG SOLIDS. H. L. Hanson, Symposium on Acceptance Testing Methodology, Oct., 1953, sponsored by Quartermaster Food and Container Institute, published Oct., 1954, by National Academy of Sciences, Washington, D.C., pp. 20-24. The dilution test method has been found satisfactory for determining the relative flavor stability of two types of dried eggs that differed in original flavor and differed in rate of off-flavor development during storage at elevated temperature.

SENSORY TEST METHODS. I. THE TRIANGLE INTENSITY (T-I) AND RELATED TEST SYSTEMS FOR SENSORY ANALYSIS. J. G. Davis and H. L. Hanson, Food Technol. 8(7):335-339, July, 1954. A method for the calculation of levels of significance has been developed in which use is made of the information contained in partially correct judgments for 3 or more samples that represent two levels of intensity of a given quality. A method for the graphical estimation of significance levels for the 3-sample test is presented.

HEAT RESISTANCE OF STRAINS OF SALMONELLA IN LIQUID WHOLE EGG, EGG YOLK, AND EGG WHITE. W. W. Osborne, R. P. Straka, and H. Lineweaver, Food Research 19(4):396-401, July-Aug., 1954. Studies were made of variations in heat resistance of Salmonella organisms with respect to species, strain, pH of suspending medium, numbers, and recovery method. The importance of numbers and existence of at least one comparatively highly heat resistant strain of Salmonella emphasizes the need for keeping Salmonella counts very low.

*BACTERIOLOGY OF COMMERCIAL POULTRY PROCESSING. M. F. Gunderson, H. W. McFadden, and T.S. Kyle, Burgess Pub. Co., Minneapolis, Minn., 98 pages (processed) 1954. Research reported was conducted under contract in the College of Medicine, University of Nebraska, Omaha. Studies are reported on fresh frozen, frozen precooked, and cooked boned products. Factors that contribute to variations in bacterial populations of products are discussed. Some concepts important to the frozen food industry in the production of improved products are developed.

*ROLE OF TOCOPHEROL CONTENT IN THE STABILITY OF CHICKEN AND TURKEY FATS (abstract). E. P. Mecchi, M. F. Pool, and A. A. Klose, Poultry Science 32 (5):915-16, Sept., 1953. A summary of studies to be reported that indicate that tocopherol content of the fat is the principal if not the only component that causes chicken fat to be much more stable than turkey fat.

*PROCESSING PRE-COOKED FROZEN POULTRY PRODUCTS. H. L. Hanson, Indus. Refrig. 127(1):31, July, 1954. A review of problems in the production of frozen fried chicken, creamed poultry products, and frozen hard cooked eggs.

*FREEZING OF COOKED POULTRY AND EGG PRODUCTS. H. L. Hanson, Frosted Food Field 19(1):20-21, July, 1954. A summary of studies on the following frozen products: fried chicken, creamed chicken and related products, creamed turkey and related products, and desserts containing eggs. Effects of temperature on storage stability of these products are discussed.

PHARMACOLOGY

OBSERVATIONS ON THE ACUTE TOXICITY OF CINNAMYCIN, A POLYPEPTIDE ANTIBIOTIC. A. M. Ambrose, Antibiotics and Chemotherapy 4(12):1242-44, Dec., 1954. The acute toxicity of cinnamycin hydrochloride was determined for Swiss albino mice by single intraperitoneal and subcutaneous injections. For comparison, the acute toxicity of purified cinnamycin, as the acetate, was determined by single intraperitoneal administration. The LD_{20} of the purified cinnamycin has been estimated to be between 5 and 10 mg. per kilogram of body weight. Subcutaneous administration of the impure hydrochloride, in doses of 400 mg./kg. or less, were nonlethal.

VEGETABLES

HYGROSCOPIC EQUILIBRIA IN DRIED BEANS. W. J. Weston and H. J. Morris, Food Technol. 8(8):353-355, Aug., 1954. Data were obtained on seven varieties or types of dry beans held at relative humidities ranging from 11 to 98 percent for 23 weeks or until onset of molding. Temperature of the experimental storage was 25°C.

STABILIZATION OF DEHYDRATED CABBAGE BY IN-PACKAGE DESICCATION. H. K. Burr and V. G. Silveira, Food Technol. 8(10):452-56, Oct., 1954. Montmorillonite was tested as a substitute for calcium oxide as an in-package desiccant for dehydrated cabbage. While somewhat less efficient than lime, it permitted a substantial stabilization of the product at a sacrifice of only a few percent of container volume. A new rehydration test for dehydrated cabbage is described.

*FLAVOR ORIGIN. FLAVOR AND ODOR COMPONENTS IN THE TOMATO. M. S. Spencer and W. L. Stanley (with Univ. Calif.), Jour. Agr. and Food Chem. 2(22):1112-18, Oct. 27, 1954. Separations of tomato flavor concentrates obtained from the deaerator and the tube evaporator, as well as separations of solvent extracts, showed that natural tomato flavor is composed of a complex mixture of compounds. From all types of flavor concentrates a definite, rather narrowly defined fraction possessing the typical tomato odor was obtained.

POTATO COMPOSITION. SURVEY OF THE MAJOR AND MINOR SUGAR AND STARCH COMPONENTS OF THE WHITE POTATO. S. Schwimmer, A. Bevenue, W. J. Weston, and A. L. Potter, Jr., Jour. Agr. And Food Chem. 2(25):1284-90, Dec. 8, 1954. Trace amounts of sugars chromatographically similar in behavior to ketoheptose, melibiose, melezitose, raffinose and a non-moving fructosan along with significant quantities of inositol were detected. Of the three major sugars (sucrose, fructose, and glucose), fructose seemed most responsive to temperature changes. Neither amylose amylopectin ratio nor phosphorus content of the starches was affected by storage time and temperature. A study of starch dispersion procedures has defined optimum conditions of solubilization of starch for starch-iodine blue-value determinations.

DEHYDROFREEZING OF FRUITS AND VEGETABLES. W. F. Talburt and F. E. Lindquist, Food Science Abstracts. (See under Fruits.)

*PRODUCTION OF MUSHROOM MYCELIUM BY SUBMERGED CULTURE IN A LIQUID MEDIUM. Patent 2,693,665 to H. Humfeld, Nov. 9, 1954. Concerns the growing of mushroom organism in tanks containing an aerated, liquid nutrient medium. The product is the vegetative portion of the plant, which is useful as a food. The propagation is carried out in the same general way that yeast and other microorganisms are grown. A sterile liquid medium is inoculated with the mushroom mycelium and growth is carried out under agitated, aerated conditions. After the culture is complete, the medium is centrifuged and the mycelium is recovered as a cream-like mass, which may be canned, dehydrated, or frozen to preserve it. The product is particularly adapted for imparting a mushroom flavor to soups, gravies, creamed food dishes, etc. Relatively lost-cost nutrients such as urea and ammonium salts can be used as the nitrogenous nutrients in the culture medium.